

ELECTROPORATION AS A TOOL FOR BIOTECHNOLOGY AND MEDICINE WITH SPECIFIC EMPHASIS ON ITS APPLICATION FOR DRUG AND GENE DELIVERY. REVIEW

Saulius Šatkauskas, Gintautas Saulis

Vytautas Magnus University, Biology Department, Vileikos 8; LT-3035 Kaunas, Lithuania;
Tel.: +370 37 45 13 69 ; E-mail: absasa@vaidila.vdu.lt

Summary. It is known that short and sufficiently strong electric field pulses may temporary increase permeability of the cell membranes providing facilitated access of exogenous molecules into the cells and tissues. The phenomenon is known as electroporation or electropermeabilization. Because of its physical nature and easiness to use, electroporation has gained wide application in cell biology, biotechnology, human and veterinary medicine. In the first part of this review the main *in vitro* applications of electroporation: electrosterilization, electroloading, electrofusion, electroinsertion are presented. Recently electroporation was applied to the tumor tissues to introduce nonpermeant cytotoxic drugs (like bleomycin) into tumor cells *in vivo*. Such electrochemotherapy allows one to obtain very high responses of the tumor treatment with highly reduced bleomycin doses. The most recent application of *in vivo* electroporation is delivery of genes to various tissues. The method has been shown to be effective to electrotransfer plasmid DNA to muscles, liver, skin, tumors, mouse testis, arteries and nervous tissues. It is believed that such method of DNA electrotransfer to tissues can be applied in the gene therapy to treat various acquired and congenital diseases. Thus, in the second part of this review, current status of the electroporation for drug and gene delivery into tissues is discussed.

Keywords: electroporation, electropermeabilization, electrochemotherapy, electrogenetherapy, gene therapy, gene transfer, drug delivery.